Countryside Bird Survey (CBS)
Species Trends 1998-2021

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The Countryside Bird Survey (CBS) has been in operation since 1998. Its primary aim is to monitor widespread terrestrial breeding bird populations in the Republic of Ireland. The CBS is an annual survey that is underpinned by the efforts of around 225 observers each year – mostly volunteers. The survey aims to measure changes in bird numbers based on a random selection of 1km sample plots, stratified by region, surveyed from year to year (Lewis *et al.* 2019). The resulting data are the species diversity and species abundance of each survey square each year. Following statistical analysis, a series of annual indices are produced for each individual bird species based on the results of each annual survey. These indices relate the population in a given year to a 'baseline' – the first year that data are available (1998 in CBS), which is given a value of 100. Thereafter, the index expresses the population as a percentage of this 'baseline'. The word 'index' is derived from the Latin *indicare*, meaning to 'point out' or 'to show', hence the population index shows how the population is faring over time i.e. the population trend for each species.

Survey design and field methods

The CBS is based on a random stratified sampling approach. At the commencement of the survey, the Republic of Ireland was divided into eight regions, based on the administrative divisions of the National Parks and Wildlife Service at that time. These regions varied in size, and each contained between three and four counties. 10km squares (based on the Irish National Grid) were randomly selected within each region for coverage. Those squares with less than 50% land, for example coastal areas or lake shores, were excluded, leaving some 700 possible survey squares. For each 10km square selected, the 1km square at the extreme south-west corner is then included for possible survey. The survey aims to achieve coverage of the same 1km squares every year, ideally by the same observer, although there is some turnover of survey participants. Within each square, the ideal survey route comprises two parallel transects, each 1km in length, about 500m apart, and about 250m from the edge of the square. However, for practical reasons there is sometimes deviation from the ideal route (Crowe *et al.* 2010). Each 1km transect is divided into five 200 m sections, at which level all information is collected. Three visits to each survey square per year are undertaken. During a reconnaissance visit,

the transect routes are planned and habitat information recorded. Habitat data are recorded using codes from an established hierarchical system common to a range of bird surveys in the UK (Crick 1992). Bird counts are undertaken on the second and third visits, within the periods 1st April-15th May and 16th May-30th June respectively, covering both the early and late summer periods

Data analyses – species trends

The total numbers of adult birds of each species detected in each 1km square were calculated for each year. The maximum of the two counts (from early and late visits) was used as the annual measure of relative abundance for each species. Annual population indices for each species were calculated using RTRIM (Bogaart *et al.* 2020), an implementation of TRIM (Trends & Indices for Monitoring Data), software used to analyze possibly sparse time series count data (Pannekoek & van Strien 1996). Counts are modelled as a function of square (site) and year effects, with interpolated estimates for site-year combinations with missing data. The stratified sampling design results in unequal representation of regions across Ireland, so annual counts were weighted by the inverse of the proportion of the area of each region that was surveyed that year.

Population trends for species occurring in a mean of 30 or more squares over the duration of the survey were estimated by examining the overall rate of annual change. Precision of trends below this threshold considered to be low (Joys *et al.* 2003).

Population change is shown in the form of annual indices, where the result from the first season (1998) is constrained to a value of 100, and results for all other years are expressed relative to this baseline. A constant rate of decline is exponential when illustrated. For example, if a population is declining by 50% each year, then if the initial index is 100, the index at year 2 is 50, and at year 3 is 25. If the population doubles each year, then the index values for the respective timepoints are 200, 400 and 800. Index values are thus measures of relative abundance for a species, and usually the relationship between this and the absolute abundance is unknown.

The mean annual change was calculated as the slope of the line of best fit through the annual indices and was extrapolated across the time series 1998-2021 to generate modelled values assuming a linear fit.

References

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